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# Role of osmolytes in adaptation of osmotically stressed and chill-stressed Listeria monocytogenes grown in liquid media and on processed meat surfaces.

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Listeria monocytogenes is a food-borne pathogen that is widely distributed in nature and is found in many kinds of fresh and processed foods. The pervasiveness of this organism is due, in part, to its ability to tolerate environments with elevated osmolarity and reduced temperatures. Previously, we showed that L. monocytogenes adapts to osmotic and chill stress by transporting the osmolyte glycine betaine from the environment and accumulating it intracellularly (R. Ko, L. T. Smith, and G. M. Smith, J. Bacteriol. 176:426-431, 1994). In the present study, the influence of various environmental conditions on the accumulation of glycine betaine and another osmolyte, carnitine, was investigated. Carnitine was shown to confer both chill and osmotic tolerance to the pathogen but was less effective than glycine betaine. The absolute amount of each osmolyte accumulated by the cell was dependent on the temperature, the osmolarity of the medium, and the phase of growth of the culture. L. monocytogenes also accumulated high levels of osmolytes when grown on a variety of processed meats at reduced temperatures. However, the contribution of carnitine to the total intracellular osmolyte concentration was much greater in samples grown on meat than in those grown in liquid media. While the amount of each osmolyte in meat was less than 1 nmol/mg (fresh weight), the overall levels of osmolytes in L. monocytogenes grown on meat were about the same as those in liquid samples, from about 200 to 1,000 nmol/mg of cell protein for each osmolyte. This finding suggests that the accumulation of osmolytes is as important in the survival of L. monocytogenes in meat as it is in liquid media.

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